or diathermy, is used in addition to massage for pain over the wrist; when this is associated with stiffness, faradism to the forearm muscles is sometimes tried, also sinusoidal current arm baths. When stiffness of the joints persists after eight weeks without pain, the masseuse gives movement of the stiff joints with a steady pull on the resisting muscles. The patient also performs active mobility exercises—pronation and supination with a weighted stick, and wrist flexion and extension by means of a pulley, the patient assisting movement by pulling on the rope with the sound hand. To lengthen the lever arm, the hand is fixed in a clamp and the rope attached to a bar projecting from the distal end.

The remaining 12 cases (3.7 per cent. of the total) may be regarded as bad results. This group is at once the most interesting and instructive, as it gives some indication of loopholes in the treatment. The cases are given in detail.

Ref. No.	Sex.	Age.	Type.	Notes.
C15	F.	57	Colles	Open operation at another hospital. Median paralysis; stiff wrist and fingers.
D46	F.	50	Colles	Attended clinic 9 months after injury with marked backward tilt. Pain and stiffness of wrist and fingers.
A30	M.	61	Backfire, Type 1	Attended for 78 days. Pain and stiffness in wrist: no displacement. Commenced massage on sixth day and wrist movement on thirteenth.
C5	M.	40	Backfire, Type 2	Painful weak wrist, with marked limitation of movement. Marked osteo-arthritis before injury. (There was severe comminution in this case.)
D12	F.	53	Colles	Painful weak wrist; grip poor; fingers stiff. Marked osteo-arthritis before injury.
D3	F.	45	Colles	Painful stiff wrist; third and fourth fingers stiff. Very marked comminution with severe backward tilt before reduction. Massage commenced ninth day, and wrist movement on eleventh. Splint discarded on eighteenth day.
E2	F.	41	Colles	Marked limitation of rotation; wrist painful. Massage commenced on third day, wrist movement on sixteenth.
E26	F.	56	Colles	Always stiff and very painful after use. Osteo-arthritis present before injury. Massage commenced on third day, wrist movement on sixteenth.
F12	F.	42	Double Colles	*Right wrist*: Weak, with marked backward tilt. Operation by Mr. Fairbank, 1926. Now satisfactory. *Left wrist*: Perfect result.
J16	F.	52	Colles	Wrist and fingers very stiff. Attended for 18 months. Slight unreduced backward displacement.
K11	F.	52	Double Colles	*Right wrist*: Constant pain in wrist; swollen at night. Marked unreduced backward tilt. *Left wrist*: Perfect result. Slight backward displacement, but no tilt.
L9	M.	38	Backfire, Type 2	Backward tilt with a weak stiff wrist.

It will be noted that in three of the cases arthritis was present before injury, and was probably responsible for the bad result. One case (C15) came to the clinic after an open operation at another hospital. Another (D46) attended for a few days after injury, and was then not seen for a period of nine months.

An instructive case is that of F12. Both left and right wrists were fractured. In the left the position was good, and a perfect result was obtained. In the right there was marked backward tilt and a weak wrist in consequence. This was operated upon by Mr. Fairbank, the tilt being corrected by a curved osteotomy. Two years later the patient reports that the wrist is satisfactory, and gives no trouble with housework. K11 also had a double fracture. On the left there was a slight degree of backward displacement, but no tilt, and a perfect result was obtained. On the right there was backward displacement with tilt, and a bad result was obtained. L9 was also left with an unreduced backward tilt. These three cases well illustrate the importance of correction of the backward tilt. In the four remaining cases, no cause for the failures can be assigned.

We wish to thank Mr. H. A. T. Fairbank for the very kindly interest he has taken in this article, and both Mr. Fairbank and Mr. St. J. D. Buxton for allowing us to make free use of the material upon which it is based. Our thanks are also due to Dr. Grace Batten for looking up the very numerous radiograms.

MINERS' CRAMP.

BY

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A CASE of miners' cramp which has lately been under my care is, I think, of sufficient interest to record as the complaint is not uncommon, although references to it in literature are very scarce, and whilst it arises out of and during the course of employment and may make a man lose time for a couple of weeks or more, it is not a scheduled disease under the industrial section of the Workmen's Compensation Acts.

A miner, aged 44, was sent to me by his doctor for curious attacks of cramp, which came on while he was working. They began suddenly in the fingers and toes (in tetaniform manner), increasing in severity and gradually ascending the limbs to the back and neck. The cramp in the trunk and limbs lasted a few minutes, then eased somewhat in the limbs, but the hands and feet still remained more or less contracted and would continue so for three to four days. He would then feel well enough to return to work, although not in his former vigour. He has vomited with the severity of the pain. He has had about six or seven attacks during the last two years. He works in a mine, which he says is very hot and dry, and perspires to a considerable amount whilst working, and also when walking about after recovering from an attack of cramp.

During his working hours (one shift 5.30 a.m. to 2.30 p.m.) he drinks five to six pints of water, followed by about a pint of tea with his dinner, and half a pint for tea, and he takes about four glasses of beer in the evening—that is, about 8½ pints of fluid in the day. He does not take salt except with his food, and has no particular desire for salt food, as some miners who suffer from the cramps have. His other workmates have complained of similar troubles, but not to such a marked degree. He had been a miner since sixteen years of age, except for fourteen months in 1919–20, when he worked in a bleach-works. He is below the average stature and the robust physique of a miner. Two years ago a large piece of coal fell on his head, and he was laid up for seven to eight weeks, septic poisoning following in the wound. A few weeks after resuming work his face became swollen for nearly a week, and he was off work about three to four weeks with this illness. It was shortly after this that the cramp commenced.

There were no objective signs of any organic disease. The urinary chloride content was not investigated because I must confess to have not known what was the cause of the man's illness until I looked up the very scanty literature on the subject, and then it was too late for thorough clinical examination. The cerebro-spinal fluid was normal. There was no evidence to show that the injury had anything to do with causing the cramp, unless it had debilitated his system and made him more liable to it than he had previously been.

Descriptions of fireman's or stoker's cramp in medical literature are fairly common, but I have only been able to find two references to miners' cramp anywhere. One is of a somewhat popular but striking nature by J. B. S. Haldane.

"Perhaps the hottest place in England is about a mile underground in a well-known Lancashire coal-pit, where the miners work in boots and bathing drawers, and empty the sweat from their boots at lunch. One man sweated eighteen pounds in the course of a shift, and it is probable that even this figure has been exceeded. This sweat contained about an ounce of salt—twice what the average man consumes in all forms per day. The salt loss was instinctively made up above ground by means of bacon, kippers, salted beer, and the like. And as long as they did not drink more than a quart of water underground no harm came to the miners. But a man who has sweated nearly two gallons is thirsty, and coal-dust dries the throat, so this amount was often exceeded, and the excess occasionally led to appalling attacks of cramp, often in the stomach, but sometimes in the limbs or back. The victims had taken more water than was needed to adjust the salt concentration in their blood, and the diversion of blood from their kidneys to their muscles and skin was so great that they were unable to excrete the excess. The miners in question were offered a solution of salt in water, which was of about the composition of sweat, and would be somewhat unappetizing to the average man. They drank it by quarts and asked for more. And now that it has become their regular beverage underground there is no more cramp, and far less fatigue. It is almost certain that the cramp of stokers, and of iron and glass workers, which is known to be due to excessive water drinking, could be prevented in the same way."

The other paper is by K. Neville Moss, professor of coal-mining, Birmingham University, and is so important from a medical point of view that I take the liberty of quoting freely from it, and recommend all interested in the subject to read it in its complete form. Its title is "Some effects

of high air temperatures and muscular exertion upon colliers."

Miners' cramp has hitherto been observed only among the workers in hot mines where the temperature varies between 98° and 102° F. dry bulb, and 83° to 87° F. wet bulb, and, as far as Moss knows, only in Agecroft and Pendleton pits. Where cases of severe cramp do not occur miners may be partially disabled in respect of working capacity by the same cause that leads finally to attacks of cramp. This subject is of general importance, therefore, in connexion with deep mining problems of the future, and in connexion with other industries where men are performing hard work at high temperatures.

The number of cases severe enough to warrant the carrying of the men out of the pit was only nine in two years, but minor attacks of cramp occurred more frequently, and would no doubt have developed into severe cases had not the men ceased work immediately.

The cramp may be attributed to: (*a*) high air temperature, (*b*) excessive drinking of water due to (*a*), (*c*) continued hard work. Men are generally affected by it during the second half of the shift, and always in the muscles actually being strained at the time. Sufferers are generally men of poor physique. If a man is attacked whilst lifting a full tub on to the rails cramp might occur in the arms, legs, or abdomen. If the latter, the man is put out of action immediately, the contortion of the abdominal muscles being so great as to form a lump the size of a cricket ball.

In severe attacks of cramp it may take half a dozen men to hold down a sufferer and straighten out the affected limb. Such treatment produces excessive exhaustion of the sufferer, and sal volatile is usually administered to revive him. Professor J. S. Haldane suggested that cramp may depend on excessive loss of chlorides by continued sweating, and the matter was then investigated by Professor Moss, Mr. J. B. S. Haldane, and Professor A. V. Hill at a deep coal face at Pendleton Colliery. A sample of urine obtained at the end of the shift from one of the colliers who was subject to cramp gave not the slightest cloudiness with silver nitrate, though only 5 c.cm. were secreted during four and a half hours. This excessive shortage of chlorides in the urine must have been brought about by a combination of excessive sweating and drinking of water. Sweating by itself could have no such effect, as sweat contains only about 0.2 per cent. of chloride, and sweating by itself would tend to concentrate the chloride in the blood plasma.

Rowntree produced water poisoning in animals by injection of large quantities of water into the stomach through a tube. The animals showed the severest symptoms, including twitching of muscles, passing into convulsions.

Water poisoning, or miners' cramp, can be avoided by supplying the miners with a drink containing just sufficient salt to balance the loss of salt by sweating—that is, 10 grains of sodium chloride in a gallon of water. The results recorded by Professor Moss are most interesting and of importance, as will be seen from the account of one case in which the saline drink was given.

The man was of poor physique; he drank eight pints of water during the shift. He had been a frequent sufferer, but since taking salt each day for three months had had no sign of cramp. His evidence was as follows: Appetite much improved; feels quite fresh after a shift's work, where formerly he was obliged to cease work at about 12.30 p.m. each day owing to excessive fatigue; his life at home was changed from one of laziness and sleep to one full of energy; in general he feels a changed man.

My own patient was given a similar saline to drink and he has kept well at his work up to date.

BIBLIOGRAPHY.

Allen, G. P. F.: Heat cramp and heat hyperpyrexia, *British Medical Journal*, 1928, i, 1098.

Elder, A. V.: Fireman's cramp and its prevention, *Med. Press*, October 7th, 1925.

Gardner, F. G.: Firemen's cramp, *British Medical Journal*, 1928, i, 382.

Haldane, J. B. S.: *Possible Worlds*, 1928, p. 77.

Haldane: Influence of hot air temperature, *Journ. of Hygiene*, vol. 5, p. 494. Work under pressure and in great heat, *Science Progress*, iv, 5, 2, 378.

Haldane, J. S.: Heat Cramp, *British Medical Journal*, 1928, i, 609.

Moss, K. Neville: *Proc. Roy. Soc.*, B, vol. 95, 1923, p. 194.

Rowntree: *Amer. Journ. Physiol.*, 1922, vol. 59, p. 451.

"Ship": Firemen's cramp, *British Medical Journal*, 1928, i, 291.

Thrower, R.: Heat cramp, *British Medical Journal*, 1928, i, 546.

PREGNANCY ASSOCIATED WITH DIABETES MELLITUS.

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PREGNANCY in a diabetic patient is commonly regarded as an extremely rare event. Not only is there a predisposition to sterility in diabetes, but it was, until recently, held that there is a strong probability of death or miscarriage should pregnancy occur. A. L. Walker[1] last year reported a case of pregnancy and labour in a diabetic woman, the first to be treated in the department of obstetrics at the Middlesex Hospital in a series of 10,000 confinements. Not a single case could be found in the records of the City of London Maternity Hospital among 27,567 patients confined. In reviewing the problem Walker argued that with the advent of insulin, and by the abolition by this agent of hyperglycaemia and acidosis, the risks attending pregnancy in a diabetic woman are not so great as in the days before the isolation of the internal secretion of the pancreas. It further seems to us that by the employment of insulin pregnancy in diabetic patients is rendered more likely.

The following case is of interest since it illustrates certain features of the association of diabetes with pregnancy, and it further throws some light upon the effect of insulin in this combination.

The patient, aged 34, was admitted to the Middlesex Hospital under the care of Dr. C. E. Lakin on June 14th, 1928, on account of diabetes associated with pregnancy.

There was nothing relevant in the family history except that one cousin had diabetes. There had been one previous pregnancy, in 1918, when a healthy child of 6½ lb. was delivered at term. In 1924 the patient began to lose weight, and sugar was discovered in the urine. She was then treated for diabetes in the Middlesex Hospital for four weeks, continuing to attend thereafter as an out-patient. In 1926 her condition deteriorated, and she was readmitted and put on insulin treatment. Equilibrium was established and maintained by doses of 10 units twice daily on a diet representing 2,130 calories.

In the autumn of 1927 she became pregnant; the date of the last menstrual period was not accurately known, but she thought it was at the end of October, 1927.

No new symptoms had been experienced since she became pregnant, and on admission the patient appeared to be in good health. The urine contained a trace of sugar; Rothera's and Gerhardt's tests were positive. The blood contained 202 mg. of sugar per 100 c.cm. This and subsequent routine estimations were conducted four hours after breakfast. The tests for albumin were negative. No physical signs were observed in the cardio-vascular system, in the respiratory system, or in the nervous system. She was then from 31 to 32 weeks pregnant. The vertex was below, the back in front and to the right. Foetal movements could be felt, and on June 30th the foetal heart was heard.

The patient was put on Allen's twelfth day diet (1,560 calories) and given 10 units of insulin daily. While under this treatment the blood sugar fluctuated between 200 and 220 mg. per 100 c.cm., but the excretion of sugar by the kidneys increased, the urine on the fifth day after admission containing 1 per cent., or 32 grams of sugar in twenty-four hours. The dosage of insulin was accordingly increased to 20 units twice daily, under which treatment the blood sugar gradually fell to a normal level, which was reached two weeks after admission. With this dosage of insulin and on Allen's tenth day diet (1,300 calories) the hyperglycaemia did not recur and the urine remained sugar-free but for occasional traces. Rothera's test, however, remained constantly positive, while Gerhardt's test was generally negative.

At 7.30 p.m. on August 15th, nine weeks after admission to the hospital, she went into labour and was transferred to the department of obstetrics under the care of Mr. Comyns Berkeley. Labour was normal; the presentation was a second vertex; the three stages of labour occupied respectively 2 hours, 15 minutes, and 15 minutes. The puerperium was apyretic and involution took place normally. The condition of the urine remained the same as before labour, a trace of lactose being present occasionally and Rothera's reaction remaining positive.

The child, a male, was healthy at birth and weighed 7 lb. 11½ oz., measuring 20 inches in length. It was fed at the breast from birth. During the first three days of life the weight fell to 7 lb. 4½ oz. On the eighth day after delivery the weight was the same as that recorded at birth. Thereafter a steady gain in weight was recorded. The content of sugar in the child's blood was normal and the urine showed no abnormality.